AE

August 31, 1959 COCOM Document No. 3656

Memorandum from the U.S. Delegation

on

THE INTERPRETATION OF ATOMIC ENERGY LIST ITEMS 5 (DEUTERIUM)

AND 8 (ZIRCONIUM)

Reference: COCOM Document No. 3632

1. As indicated in the referenced document, the German Delegate on July 23, 1959, raised certain questions in connection with the interpretation of Atomic Energy List Items 5 and 8 and requested the views of member governments in regard thereto.

2. The views of the United States Government on the questions raised by the German Delegate are set forth below, along with explanatory and elaborative material that may be of interest to other delegations and their governments:

AE-5: This item covers all hydrogen containing materials which have deuterium enrichments. Naturally occurring materials containing hydrogen would have less than one to five thousand parts of deuterium to hydrogen. If the ratio of deuterium to hydrogen in any material exceeds 1 to 5000 by number, such a material e.g., sugar, water, hydrocarbon, etc., would be covered, since the material would necessarily have had artificial enrichment in deuterium.

Since the cost of enrichment in deuterium is inversely proportional to the concentration of deuterium it is important that the strategic cut-off be just above the deuterium concentration in naturally occuring materials. Ninety-five percent of the deuterium enrichment cost is in bringing deuterium concentration to one part in a hundred and the greatest part of this cost would be in the first fractional enrichment. Only about five percent of the deuterium enrichment cost lies in the concentration of it from about 1% to 99%.

AE-8: This item is intended to cover all forms of zirconium which has been artifidally depleted in hafnium. The ratio does refer to all zirconium forms.

Hafnium occurs in nature together with zirconium in an amount of about 2% of the contained zirconium. Because of their chemical similarity very special techniques and facilities are required for their separation. For usual applications the properties of the zirconium product are not changed by the hafnium. In many atomic energy applications, however, a metal with a low neutron absorption factor is needed. The neutron absorption factor for hafnium is high; therefore it is necessary to remove all hafnium from zirconium used in the production of atomic energy equipment. Zirconium, hafnium free, is used widely in nuclear apparatus, e.g., atomic submarines, because it is strong, resists corrosion and has high melting point in addition to the low neutron absorption factor.

Chemical forms of hafnium free zirconium are convertible to zirconium oxide, a refractory material used in nuclear apparatus, and to the metal.